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Controlling Factors of Soil Water in Piedmont Landscapes

Why Does it matter?

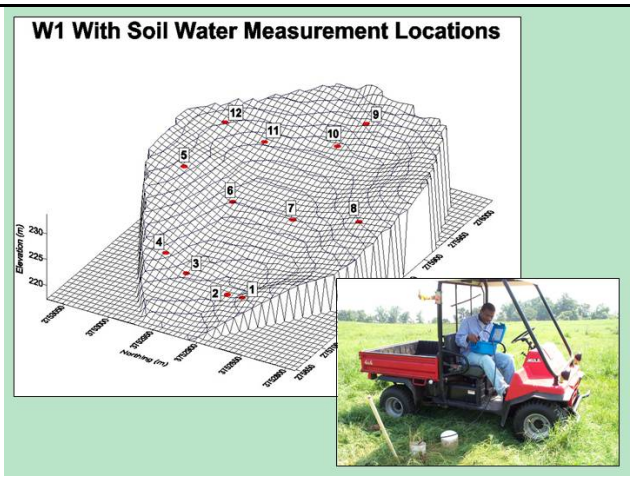
Despite the importance of soil water information in many areas like agriculture, water resource planning, runoff, flood, erosion and water quality control, there is very little regular and continuous measurement of soil water. Knowledge and understanding of how soil water varies over time and across landscapes is of fundamental importance to understanding processes that impact agriculture and the environment.

What was done?

Soil water was measured to 4 ft depth at 12 locations and over three years in a 19-acre pasture using time domain reflectometry (TDR)-based probe sensors. A 4 ft probe was vertically inserted in the soil at each location and measurement was made with a portable TDR meter. Probes were designed to measure average volumetric soil water content in five segments of 0 to 6, 6 to 12, 12 to 24, 24 to 36 and 36 to 48 in. Reading intervals varied but often readings were taken as frequent as two to three times a week for a total of 144 observations.

What was found?

Soil water was greatest in winter and least in summer with transitions in spring and fall. The depth where the highest clay concentration in the subsoil begins (Bt horizon) controlled the soil water content of the soil above in a major way by restricting water movement through this zone of high clay content. Soils higher up in the landscape, where the Bt was close to the surface due to erosion, were generally wetter than soils lower in the landscape where the Bt was deeper. This phenomenon occurred just prior to rainfall events also suggesting that the upper landscape is a likely zone for runoff generation because the soil gets more saturated before rainfall events.



What is the impact?

In the Piedmont, a 41 million acre region extending from Alabama to Virginia, over 86% of the soil is classified as eroded and would be a candidate for identification of the location of the Bt horizon to estimate soil water distribution in time and space. The information can be used to differentiate plant water availability, yield differentials, etc., as well as in design and implementation of best management practices to reduce environmental impacts across landscapes. It will be useful in precision agriculture applications as well.

Research Team and Contact information

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